CLAIMS

1   An apparatus for channel estimation of a communication device with a transmit path and a receive path both coupled to a communication medium and the apparatus comprising.

5   a generator coupled to the transmit path for periodically injecting a codeword signal into the transmit path which effects both a leakage signal on the receive path as well as reflected signals from various portions of the communication medium.

an analog-to-digital converter coupled to the receive path to digitize a composite received signal including both the leakage signal and the reflected signals;

10   and

a correlator to correlate delays between the leakage signal and each of the reflected signals to estimate channel characteristics for the communication medium

2   The apparatus of Claim 1. wherein the codeword comprises a pseudo

15   random sequence

3   The apparatus of Claim 1. wherein the codeword comprises a pseudo random sequence with an interval of pseudo randomness greater in duration than a return time associated with a selected one of the reflected signals reflected from a

20   furthest selected portion of the communication medium

4   The apparatus of Claim 1. wherein the codeword comprises a pseudo random binary sequence consisting of a binary "1" and a binary "-1"

25   5   The apparatus of Claim 1. wherein said generator comprises a digital signal processor

6   The apparatus of Claim 1. wherein said generator comprises

a circular shift register switchably coupled to the transmit path during channel

30   estimation and with a periodicity N greater in duration than a return time associated with a selected one of the reflected signals reflected from a furthest selected portion of the communication medium

VELCP008X1   Page 21

7.   The apparatus of Claim 1, further comprising

a filter on the receive path for reducing a power associated with the leakage signal on the receive path: and

a switch operable to decouple the filter from the receive path during the injecting of the codeword to increase the power associated with the leakage signal on the receive path

8.   The apparatus of Claim 1. wherein the correlator further comprises

a logic for determining an ordered set of correlation coefficients for the codeword with respect to the composite received signal.

a peak detector for detecting peaks within the ordered set of correlation coefficients.

a leakage peak detector for determining which among the peaks detected by said peak detector corresponds with the leakage peak: and

a sequencer for sequentially ordering the peaks corresponding with a time of receipt of each of the reflected signals with respect to the peak corresponding with the time of receipt of the leakage signal to estimate channel characteristics for the communication medium

10.   The apparatus of Claim 1. wherein the communication medium comprises one of a wired and an optical communication medium

11.   The apparatus of Claim 1. wherein the communication device comprises one of a physical modem and a logical modem

12.   The apparatus of Claim 1 wherein the communication device implements at least one X-DSL communication protocol

13.   A method for channel estimation in a communication device with a transmit path and a receive path both coupled to a communication medium. and the method comprising the acts of:

periodically injecting a codeword signal into the transmit path which effects both a leakage signal on the receive path as well as reflected signals from various portions of the communication medium.

digitizing a composite received signal including both the leakage signal and the

5   reflected signals; and

correlating delays between the leakage signal and each of the reflected signals to estimate channel characteristics for the communication medium

14.   The method of Claim 13, wherein the codeword comprises a pseudo

10   random sequence

15.   The method of Claim 13, wherein the codeword comprises a pseudo random sequence with an interval of pseudo randomness greater in duration than a return time associated with a selected one of the reflected signals reflected from a

15   furthest selected portion of the communication medium

16.   The method of Claim 13, wherein the codeword comprises a pseudo random binary sequence consisting of a binary "1" and a binary "-1"

20   17.   The method of Claim 13, further comprising the acts of:

determining an ordered set of correlation coefficients for the codeword with respect to the composite received signal.

detecting peaks within the ordered set of correlation coefficients;

determining which among the peaks detected by said peak detector

25   corresponds with the leakage peak; and

sequentially ordering the peaks corresponding with a time of receipt of each of the reflected signals with respect to the peak corresponding with the time of receipt of the leakage signal to estimate channel characteristics for the communication medium.

30